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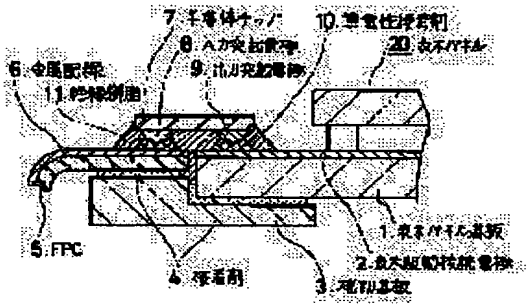
(71)Applicant : CITIZEN WATCH CO LTD
(72)Inventor : KANEKO YASUSHI
NAGASHIMA TAKAYUKI

(54) MOUNT STRUCTURE FOR SEMICONDUCTOR CHIP FOR DRIVING DISPLAY PANEL

(57)Abstract:
PROBLEM TO BE SOLVED: To improve connection reliability by reducing a cross phenomenon by the reduction of input resistance and preventing a connection part from being broken by the reinforcement of an auxiliary substrate.
SOLUTION: The mount structure consists of an FPC 5 which has metal, wiring, a display panel substrate 1 which has a display driving connection electrode, a semiconductor chip 7 which has an input projection electrode 8 and an output projection electrode 9 adhered to the metal wiring 6 and display driving connection wiring with conductive adhesives 10 over both the FPC 5 and display panel substrate 1, and an auxiliary substrate 3 which is backed over both the FPC 5 and display panel substrate 1 and reinforces the abutting parts of both. Then the auxiliary substrate 3 has an upper-stage part and a lower-stage part which are different in height because of a step; and the metal wiring 6 is adhered and fixed to the upper-stage part and the display driving connection electrode 2 is adhered and fixed to the lower stage part so that the both are almost in level with each other.



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[Claim(s)]

[Claim 1] A flexible printing substrate which has metal wiring A display-panel substrate which constitutes some display panels and has a display drive connection electrode in a periphery A semiconductor chip which has an input projection electrode and an output projection electrode which have been pasted up on said metal wiring and said display drive connection wiring with electroconductive glue ranging over both said flexible printing substrate and said display-panel substrate, respectively An auxiliary substrate with which it is backed ranging over both said flexible printing substrate and said display-panel substrate, and both contact section is reinforced It is the mounting structure of a semiconductor chip for a display-panel drive equipped with the above, and is characterized by carrying out the former at the upper case section, and said auxiliary substrate carrying out adhesion immobilization of the latter at the lower-berth section, respectively so that it may have the upper case section and the lower-berth section from which height differs with a level difference and said metal wiring and said display drive connection electrode may be mostly located in a line on the same plane.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the mounting structure of the semiconductor chip by the COG method (Chip On Glass) which carries out direct continuation of the semiconductor chip to a display-panel substrate especially using a flexible printing substrate (the following, FPC, and publication) about the connection structure of display-panel substrates, such as a liquid crystal display, an electroluminescence (EL) display, and a light emitting diode (LED) display, and a semiconductor chip.

[0002]

[Description of the Prior Art] There is a method of mounting TCP (Tape Carrier Package) package-ized by the TAB method (TapeAutomated Bonding) in a display-panel substrate as a conventional example which mounts the semiconductor chip to a display panel. Moreover, a semiconductor chip is connected to a direct presentation panel substrate by the COG method

(Chip On Glass), and there is structure of mounting FPC in the wiring on the display-panel substrate in connection with a power supply and an input signal.

[0003] However, in connection between FPC and a display-panel substrate, when the connection pitch of 100 micrometers or less is required, the COG method in which semiconductor chip complete mounting is possible is used. Hereafter, the conventional COG method is explained using drawing 6 . Drawing 6 is the ** type enlarged view showing the cross-section configuration in the condition of having used the COG method and having connected a semiconductor chip 7 and FPC5 on the display-panel substrate 1.

[0004] With plating or a vacuum deposition method, the metal of copper metallurgy is used and the input projection electrode 8 and the output projection electrode 9 are formed in a semiconductor chip 7. Next, the electroconductive glue 10 which mixed the electric conduction grain at the adhesives of an epoxy system is applied to the point of said input projection electrode 8 and the output projection electrode 9 with print processes or a dip method. The location of a semiconductor chip 7 and the display-panel substrate 1 is doubled using a binocular microscope after that, and the output projection electrode 9 and the input projection electrode 8 are connected to the display drive connection electrode 2 and the input connection electrode 21 which have been arranged to the display-panel substrate 1 which consists of glass, respectively. Said display drive connection electrode 2 and the input connection electrode 21 consist of transparence electric conduction films, such as Indium Tin Oxide (the following, ITO, and publication).

[0005] Furthermore it heat-treats and electroconductive glue 10 is stiffened. Thereby, electrical installation with good output projection electrode 9, display drive connection electrode 2 and input projection electrode 8, and input connection electrode 21 is obtained. It heat-treats by slushing into the crevice between a semiconductor chip 7 and the display-panel substrate 1 after that the insulating resin 11 which consists of organic system materials, such as an epoxy system, and insulating resin 11 is stiffened. Next, alignment of the metal wiring 6 of FPC5 and the input connection electrode 21 of the display-panel substrate 1 is carried out, and the FPC connection and the metal wiring 6 which hit the periphery section of the input connection electrode 21 are connected using the different direction conductive liner sheet which mixed the electric conduction grain in the thermosetting resin sheet.

[0006] Although the resistance of the metal wiring 6 of FPC5 mounted by the above method is small, since the input connection electrode 21 is formed for it by high ITO of resistance with 1 ohm or less, input resistance will become dozens of ohms or more. Therefore, the supply voltage inputted into a semiconductor chip 7 is not stabilized, but supply voltage is changed with a display image, and it becomes easy to generate the cross talk phenomenon in which the display of those other than a display pattern is influenced.

[0007] Then, in order to solve this problem, how to use electroconductive glue 10 and to paste up the input projection electrode 8 of a semiconductor device 7 and the metal wiring 6 of FPC5

directly can be considered. The example is explained using drawing 7 below. Alignment is performed for the metal wiring 6 on the display drive connection electrode 2 on the display-panel substrate 1 which consists of glass, and FPC5 using a binocular microscope, and the display-panel substrate 1 and FPC5 are pasted up through adhesives 4. Adhesives 4 may be thermosetting epoxy system adhesives etc., and either the shape of a liquid or a film has as them. A level difference is formed in the field of the display drive connection wiring 2 on the display-panel substrate 1, and the field of the metal wiring 6 on FPC5 at this time.

[0008] Next, on a semiconductor chip 7, with plating etc., the metal of copper metallurgy is used and the input projection electrode 8 and the output projection electrode 19 are formed. The height of the output projection electrode 19 is made larger than the height of the input projection electrode 8 so that a level difference may be made to the input projection electrode 8 and the output projection electrode 19 at this time. The value of this level difference is formed so that it may become the same as that of what applied the thickness of FPC5 which has the metal wiring 6, and the thickness of said adhesives. Next, the electroconductive glue 10 which mixed the electric conduction grain at the adhesives of an epoxy system is applied to the point of the input projection electrode 8 and the output projection electrode 19 with print processes or a dip method. After that, using a binocular microscope, doubling is performed for the location of a semiconductor chip 7, the display drive connection electrode 2 arranged to the display-panel substrate 1, and the metal wiring 6 on FPC, and the output projection electrode 19 and the input projection electrode 8 are connected to the display drive connection electrode 2 and the metal wiring 6, respectively. Furthermore it heat-treats and electroconductive glue 10 is stiffened. Thereby, electrical installation with good output projection electrode 19, display drive connection electrode 2 and input projection electrode 8, and metal wiring 6 is obtained.

[0009] According to the above method, input resistance is reduced by several ohms or less. Therefore, the supply voltage inputted into a semiconductor chip 7 will be stabilized, and the cross talk phenomenon of a display panel will be improved. However, the height of the input projection electrode 8 of a semiconductor chip 7 will become [the height of the output projection electrode 19] very as high as 110-130 micrometers so much at 5-20 micrometers. Although it is possible, processing of this output projection electrode 19 is not desirable if the method of application and mass-production nature of the stability as an electrode and electroconductive glue are taken into consideration.

[0010] then, the height of an output projection electrode and the height of an input projection electrode -- ** -- how to paste up the input projection electrode 8 and the metal wiring 6 directly can be considered as the same. The example is explained using drawing 8 below. With plating or a vacuum deposition method, the metal of copper metallurgy is used and the input projection electrode 18 and the output projection electrode 9 are formed in a semiconductor chip 7. Next, the electroconductive glue 10 which mixed the electric conduction grain at the

adhesives of an epoxy system is applied to the point of said output projection electrode 9 with print processes or a dip method. Then, as the input projection electrode 18 comes out of the display drive connection electrode 2 of the display-panel substrate 1, and the output projection electrode 9 prepared in the semiconductor chip 7 to the exterior of the display-panel substrate 1 using a binocular microscope, alignment is performed using a binocular microscope. A semiconductor chip 7 is pressurized continuously and the display-panel substrate 1 is made to heat and harden electroconductive glue 10, where temporary connection is made.

[0011] Next, it is made to heat and harden after pouring into the boundary region of the output projection electrode 9 of a semiconductor chip 7 the insulating resin 11 which consists of organic materials, such as an epoxy system and a rubber system. At this production process, it takes care that insulating resin 11 does not turn around the input projection electrode 18. Next, temporary adhesion of the different direction conductive sheet 12 is carried out at FPC5. Moreover, a semiconductor chip 7 performs alignment of the metal wiring 6 of FPC5, and the input projection electrode 18 of a semiconductor chip 7 in the downward condition. Thermocompression bonding of the different direction conductive sheet 12 is continuously carried out from the FPC5 side, and FPC5 and a semiconductor chip 7 are pasted up. The input projection electrode 18 is connected with the metal wiring 6 by this. Although illustration has not been carried out to the last, an epoxy system and rubber system resin are formed around FPC5 and a semiconductor chip 7, and each connection is protected. According to the above method, the height of the output projection electrode 9 can be set to 5-20 micrometers. However, this mounting structure also has a fear of a connection being damaged, when external force is added in a manufacturing process and after completion, and it is not desirable in respect of mass-production nature.

[0012]

[Problem(s) to be Solved by the Invention] Then, the technical problem of this invention is equipped with high connection reliability by reinforcing a connection so that it may not damage, even when direct continuation of metal wiring of FPC and the input projection electrode of a semiconductor chip is carried out when a semiconductor chip is mounted by the COG method to a display panel, and external force joins a display panel, and it is to offer the mounting structure of a semiconductor chip excellent in mass-production nature.

[0013]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem mounting structure of a semiconductor chip for a display-panel drive of this invention A flexible printing substrate which has metal wiring, and a display-panel substrate which constitutes some display panels and has a display drive connection electrode in a periphery, A semiconductor chip which has an input projection electrode and an output projection electrode which have been pasted up on said metal wiring and said display drive connection wiring with

electroconductive glue ranging over both said flexible printing substrate and said display-panel substrate, respectively, It is the mounting structure which consists of an auxiliary substrate with which it is backed ranging over both said flexible printing substrate and said display-panel substrate, and both contact section is reinforced. It is characterized by carrying out the former at the upper case section, and said auxiliary substrate carrying out adhesion immobilization of the latter at the lower-berth section, respectively so that it may have the upper case section and the lower-berth section from which height differs with a level difference and said metal wiring and said display drive connection electrode may be mostly located in a line on the same plane.

[0014]

[Function] The display-panel substrate which has a display drive connection electrode is pasted up on the lower-berth section of an auxiliary substrate which has the level difference which consists of the upper case section and the lower-berth section, and FPC which has metal wiring in the upper case section next is pasted up. At this time, the level difference of an auxiliary substrate is set as the same value as the difference of the thickness of a display-panel substrate, and the thickness of FPC so that a display drive connection electrode and metal wiring may be mostly located in a line on the same plane. Next, ranging over both FPC and display-panel substrate, the input projection electrode and output projection electrode on a semiconductor chip are connected to metal wiring and display drive connection wiring with electroconductive glue, respectively. Consequently, a cross talk phenomenon can be suppressed by direct continuation of metal wiring and the input projection electrode being carried out through electroconductive glue, they making small input connection resistance to a semiconductor chip, and stabilizing the supply voltage to input. Furthermore, an auxiliary substrate backs ranging over both FPC and display-panel substrate, and has the mounting structure of reinforcing each connection of metal wiring, an input projection electrode, and a display drive connection wiring and an output projection electrode. consequently, mounting of a semiconductor chip -- it becomes possible in process to be able to prevent failure of a connection also to the external force accidentally added after completion, and to raise connection reliability.

[0015]

[Example] The example of this invention is explained based on a drawing. Drawing 1 is the ** type enlarged view showing the cross-section configuration of the mounting structure of the semiconductor chip of the example of this invention. Drawing 2 is the ** type enlarged view showing the cross-section configuration of the auxiliary substrate in the example of this invention. Drawing 3 and drawing 4 are the ** type enlarged views showing the cross-section configuration of the middle production process of the mounting method of the semiconductor chip of the example of this invention. Drawing 5 is the ** type enlarged view showing the shape of a plan type of the mounting structure of the semiconductor chip of the example of

this invention.

[0016] The mounting structure of the semiconductor chip in a liquid crystal display is explained as an example about the example of this invention below. The auxiliary substrate 3 shown in drawing 2 consists of a thermosetting epoxy resin, carries out fabrication using metal mold, and has the upper case section 31 and the lower-berth section 32. Next, as shown in drawing 3 , it consisted of glass, and pressurizing the display-panel substrate 1 which has arranged the display drive connection electrode 2 to the periphery with a heat tool through adhesives 4 at the lower-berth section 32 of the auxiliary substrate 3, it heated at 80-120 degrees C, adhesives 4 were stiffened, and it pasted up. The above-mentioned display drive connection electrode 2 consists of transparence electric conduction films, such as ITO.

[0017] next, the display-panel substrate 1 pasted up on the lower-berth section 32 of the auxiliary substrate 3 as shown in drawing 5 -- ** -- alignment is performed to FPC5 using the alignment mark 15 prepared, respectively. Pressurizing FPC5 with a heat tool through adhesives 4 at the upper case section 31 of the auxiliary substrate 3, as continuously shown in drawing 4 , it heats at 80-120 degrees C, adhesives 4 are stiffened, and it pastes up. The level difference 33 is formed between the upper case section 31 of the auxiliary substrate 3, and the lower-berth section 32 so that the display drive connection electrode 2 and the metal wiring 6 may be mostly located in a line on the same plane in this condition. Although what is necessary is just to make magnitude of a level difference 33 equal to a display panel 1 and the difference of the thickness of FPC5, since it can adjust by the thickness of adhesives 4, it is not necessary to make it strictly equal to the difference of both thickness.

[0018] If it is made for a heat tool to also hit the display drive connection electrode 2 of the display-panel substrate 1 when using a heat tool furthermore, it will become easy to arrange the height of the metal wiring 6 of FPC5 and the display drive connection electrode 2 of the display-panel substrate 1. Moreover, there should just be 0.1mm - 5mm of width-of-face sizes of the upper case section 31 of the auxiliary substrate 3 at least that what is necessary is just more greatly than the width of face of the input projection electrode 8 on a semiconductor chip 7. Moreover, there should just be 0.1mm - 5mm of width-of-face sizes of the lower-berth section 32 of the auxiliary substrate 3 that are larger than the width of face of the output projection electrode 9 on a semiconductor chip 7 at least, and what is necessary is just the magnitude which is not applied to the display-panel configuration section.

[0019] When liquefied, adhesives 4 are supplied to the upper case section 31 of the auxiliary substrate 3, and the lower-berth section 32 of the auxiliary substrate 3 by the dispenser, and, in the case of film glue 4, are cut down and stuck on the magnitude corresponding to each. Anyway, adhesives 4 may be formed on the auxiliary substrate 3, or may be formed in the FPC5 and display-panel substrate 1 side, or whichever is sufficient as them. moreover, the PURASSU tic bead with which, as for adhesives 4, the particle size for adhesion thickness adjustment was less than [double sign 10%] equal to resin, such as epoxy, and glass fiber -- 5

- 30wt% -- it is desirable to use what was mixed. It becomes easy for this to control the thickness of adhesives 4.

[0020] Next, with plating or a vacuum deposition method, the metal of copper metallurgy is used and the input projection electrode 8 and the output projection electrode 9 are formed in a semiconductor chip 7. The configurations of this input projection electrode 8 and the output projection electrode 9 have a desirable round shape with a diameter of 50-200 micrometers. Next, a constant rate is applied to the point of said input projection electrode 8 and the output projection electrode 9 for the electroconductive glue 10 which mixed the electric conduction grain at the adhesives of an epoxy system with print processes or a dip method. Then, as shown in drawing 5 , doubling is performed for the location of a semiconductor chip 7, the display drive connection electrode 2 arranged to the display-panel substrate 1, and the metal wiring 6 on FPC using a binocular microscope, and as shown in drawing 1 , the output projection electrode 9 and the input projection electrode 8 are connected to the display drive connection electrode 2 and the metal wiring 6, respectively. It heat-treated at the temperature of 50-150 degrees C after this, and electroconductive glue 10 was stiffened. Thereby, electrical installation with good output projection electrode 9, display drive connection electrode 2 and input projection electrode 8, and metal wiring 6 was obtained. Finally the boundary region of FPC5, a semiconductor chip 7, and the display-panel substrate 1 is filled up with the insulating resin 11 which consists of organic materials, such as an epoxy system and a rubber system, and heat hardening of the insulating resin 11 is carried out after that.

[0021] In mounting of the simple matrix method liquid crystal panel whose screen size is 4 inches of vertical angles, as a result of connecting the semiconductor chip for signal electrodes by the COG method and connecting the semiconductor chip for scan electrodes with the mounting structure of this invention, the good display image with few cross talks was obtained, and the phenomenon which a connection damages during mounting and after completion was not generated.

[0022] In explanation of the example of this invention, although the example which used the thermosetting epoxy resin explained the material of the auxiliary substrate 3, if it has moderate rigidity and there is thermal resistance of 200 degrees C or more, it can be chosen as freedom, such as a metal, a ceramic, and plastics. Moreover, although the example which used electroconductive glue explained the mounting structure of a semiconductor chip in explanation of the example of this invention, the same result was obtained, even if it used the photoresist, the different direction conductive liner sheet, and the conductive bead and connected the input projection electrode 8 of a semiconductor chip 7 and an output projection electrode, the display drive connection electrode 2 of the display-panel substrate 1, and the metal wiring 6 of FPC5 instead of electroconductive glue, respectively. In addition, when a photoresist is used, the insulating resin 11 shown in drawing 1 becomes unnecessary. Moreover, in drawing 3 , after the image display portion of a liquid crystal display panel

completes adhesion with the lower-berth section 32 of the auxiliary substrate 3, and the display-panel substrate 1, it is carrying out, but in the production process before the image display portion of a liquid crystal display panel is completed, after forming the display drive connection electrode 2 in the display-panel substrate 1, the lower-berth section 32 of the auxiliary substrate 3 may be pasted.

[0023]

[Effect of the Invention] As stated above, the input resistance to a semiconductor chip can be connected by several ohms or less, making connection of display drive connection wiring of the output projection electrode of a semiconductor chip and a display-panel substrate which is the feature of the COG method by high density according to this invention, and when input power voltage is stabilized, the cross talk phenomenon of a display can be reduced. furthermore an auxiliary substrate reinforces a connection -- mounting of a semiconductor chip -- failure of a connection can be prevented also to in process or the external force accidentally added after completion, and connection reliability can be raised.

[Brief Description of the Drawings]

[Drawing 1] It is the ** type enlarged view showing the cross-section configuration of the mounting structure of the semiconductor chip in the example of this invention.

[Drawing 2] It is the ** type enlarged view showing the cross-section configuration of the auxiliary substrate in the example of this invention.

[Drawing 3] It is the ** type enlarged view showing the cross-section configuration of the mounting structure for explaining the connection production process in the example of this invention.

[Drawing 4] It is the ** type enlarged view showing the cross-section configuration of the mounting structure for explaining the connection production process in the example of this invention.

[Drawing 5] It is the ** type enlarged view showing the shape of a plan type of the mounting structure of the semiconductor chip in the example of this invention.

[Drawing 6] It is the ** type enlarged view showing the cross-section configuration of the mounting structure of the semiconductor chip in the conventional example.

[Drawing 7] It is the ** type enlarged view showing the cross-section configuration of the mounting structure of the semiconductor chip in the conventional example.

[Drawing 8] It is the ** type enlarged view showing the cross-section configuration of the mounting structure of the semiconductor chip in the conventional example.

[Description of Notations]

1 Display-Panel Substrate

2 Display Drive Connection Electrode

3 Auxiliary Substrate

4 Adhesives

5 Flexible Printing Substrate
6 Metal Wiring
7 Semiconductor Chip
8 Input Projection Electrode
9 Output Projection Electrode
10 Electroconductive Glue
11 Insulating Resin
12 Different Direction Conductive Liner Sheet
15 Alignment Mark
18 Input Projection Electrode
19 Output Projection Electrode
20 Display Panel
21 Input Connection Electrode
31 Upper Case Section
32 Lower-Berth Section
33 Level Difference

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(71)出願人　000001960
シチズン時計株式会社
東京都新宿区西新宿２丁目１番１号

(72)発明者　金子　靖
埼玉県所沢市大字下富字武野840番地　シチズン時計株式会社技術研究所内

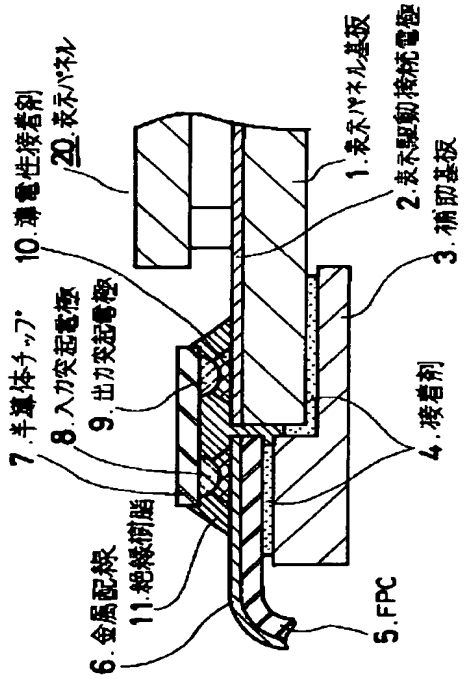
(72)発明者　長嶋　孝行
埼玉県所沢市大字下富字武野840番地　シチズン時計株式会社技術研究所内

(54)【発明の名称】　表示パネル駆動用半導体チップの実装構造

(57)【要約】

【構成】金属配線を有するＦＰＣと、表示駆動接続電極を有する表示パネル基板と、前記ＦＰＣおよび前記表示パネル基板の両者にまたがり前記金属配線および前記表示駆動接続配線にそれぞれ導電性接着剤により接着されている入力突起電極および出力突起電極を有する半導体チップと、前記ＦＰＣおよび前記表示パネル基板の両者にまたがって裏打ちされ両者の当接部を補強する補助基板とからなる実装構造であって、前記補助基板は段差により高さの異なる上段部および下段部を有し、前記金属配線および前記表示駆動接続電極が、ほぼ同一平面上に並ぶように前者を上段部に後者を下段部にそれぞれ接着固定していることを特徴とする表示パネル駆動用半導体チップの実装構造。

【効果】入力抵抗の低減によりクロストーク現象が低減し、かつ補助基板による補強で接続部の破損を防ぎ接続信頼性が向上する。



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【特許請求の範囲】

【請求項１】　金属配線を有するフレキシブル印刷基板と、表示パネルの一部を構成し周辺部に表示駆動接続電極を有する表示パネル基板と、前記フレキシブル印刷基板および前記表示パネル基板の両者にまたがり前記金属配線および前記表示駆動接続配線にそれぞれ導電性接着剤により接着されている入力突起電極および出力突起電極を有する半導体チップと、前記フレキシブル印刷基板および前記表示パネル基板の両者にまたがって裏打ちされ両者の当接部を補強する補助基板とからなる実装構造であって、前記補助基板は段差により高さの異なる上段部および下段部を有し、前記金属配線および前記表示駆動接続電極が、ほぼ同一平面上に並ぶように前者を上段部に後者を下段部にそれぞれ接着固定していることを特徴とする表示パネル駆動用半導体チップの実装構造。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、液晶表示、エレクトロルミネセンス（ＥＬ）表示、発光ダイオード（ＬＥＤ）表示などの表示パネル基板と半導体チップとの接続構造に関し、特にフレキシブル印刷基板（以下、ＦＰＣと記載）を用い、表示パネル基板に半導体チップを直接接続するＣＯＧ法（Ｃｈｉｐ　Ｏｎ　Ｇｌａｓｓ）による半導体チップの実装構造に関する。

【０００２】

【従来の技術】表示パネルへの半導体チップを実装する従来例としては、ＴＡＢ法（ＴａｐｅＡｕｔｏｍａｔｅｄ　Ｂｏｎｄｉｎｇ）によってパッケージ化されたＴＣＰ（Ｔａｐｅ　Ｃａｒｒｉｅｒ　Ｐａｃｋａｇｅ）を表示パネル基板に実装する方法がある。また、ＣＯＧ法（Ｃｈｉｐ　Ｏｎ　Ｇｌａｓｓ）により半導体チップを直接表示パネル基板に接続し、電源および入力信号に関わる表示パネル基板上の配線にＦＰＣを実装する構造がある。

【０００３】しかし、ＦＰＣと表示パネル基板との間の接続において、１００μｍ以下の接続ピッチが必要な場合は、半導体チップ全面実装が可能なＣＯＧ法が用いられる。　以下、図６を用いて従来のＣＯＧ法について説明する。図６は、表示パネル基板１上に半導体チップ７とＦＰＣ５とを、ＣＯＧ法を用いて接続した状態の断面形状を示す模式拡大図である。

【０００４】半導体チップ７に入力突起電極８と出力突起電極９をメッキ法や真空蒸着法で銅や金の金属を用いて形成する。つぎに前記入力突起電極８と出力突起電極９の先端部にエポキシ系の接着剤に導電粒を混入した導電性接着剤１０を印刷法やディップ法で塗布する。その後双眼顕微鏡を用いて半導体チップ７と表示パネル基板１との位置を合わせ、ガラスからなる表示パネル基板１に配置した表示駆動接続電極２および入力接続電極２１にそれぞれ出力突起電極９および入力突起電極８を接続

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する。前記表示駆動接続電極２および入力接続電極２１は、酸化インジュウムスズ（以下、ＩＴＯと記載）などの透明導電膜で構成されている。

【０００５】さらに熱処理を行い導電性接着剤１０を硬化させる。これにより出力突起電極９と表示駆動接続電極２および入力突起電極８と入力接続電極２１は良好な電気的接続が得られる。その後半導体チップ７と表示パネル基板１の隙間にエポキシ系などの有機系材料からなる絶縁樹脂１１を流し込み、熱処理を行い絶縁樹脂１１を硬化させる。次にＦＰＣ５の金属配線６と表示パネル基板１の入力接続電極２１とを位置合わせして、熱硬化性樹脂シートに導電粒を混入した異方導電性シートを用いて、入力接続電極２１の外周部に当たるＦＰＣ接続部と金属配線６を接続する。

【０００６】以上の方法で実装されたＦＰＣ５の金属配線６の抵抗値は１オーム以下と小さいが、入力接続電極２１は抵抗の高いＩＴＯで形成されているので、入力抵抗が数十オーム以上になってしまう。従って半導体チップ７へ入力する電源電圧が安定せず、表示画像により電源電圧が変動し、表示パターン以外の表示が影響を受けるクロストーク現象が発生し易くなる。

【０００７】そこでこの問題を解決するために半導体装置７の入力突起電極８とＦＰＣ５の金属配線６を導電性接着剤１０を用いて直接接着する方法が考えられる。以下図７を用いてその例について説明する。ガラスからなる表示パネル基板１上の表示駆動接続電極２とＦＰＣ５上の金属配線６を双眼顕微鏡を用いて位置合わせを行い、表示パネル基板１とＦＰＣ５とを接着剤４を介して接着する。接着剤４は熱硬化性のエポキシ系接着剤などで液状、フィルム状のどちらでも良い。この時表示パネル基板１上の表示駆動接続配線２の面とＦＰＣ５上の金属配線６の面に段差が形成される。

【０００８】次に半導体チップ７上に入力突起電極８と出力突起電極１９をメッキ法などで銅や金の金属を用いて形成する。この時入力突起電極８と出力突起電極１９とに段差ができるように出力突起電極１９の高さを入力突起電極８の高さより大きくする。この段差の値は金属配線６を有するＦＰＣ５の厚さと前記接着剤の厚さを加えたものと同一になるように形成する。次に入力突起電極８と出力突起電極１９の先端部にエポキシ系の接着剤に導電粒を混入した導電性接着剤１０を印刷法やディップ法で塗布する。その後双眼顕微鏡を用いて半導体チップ７と表示パネル基板１に配置した表示駆動接続電極２とＦＰＣ上の金属配線６との位置を合わせを行い、表示駆動接続電極２および金属配線６にそれぞれ出力突起電極１９および入力突起電極８を接続する。さらに熱処理を行い導電性接着剤１０を硬化させる。これにより出力突起電極１９と表示駆動接続電極２および入力突起電極８と金属配線６は良好な電気的接続が得られる。

【０００９】以上の方法によれば入力抵抗は数オーム以

下に低減される。従って半導体チップ７へ入力する電源電圧が安定し、表示パネルのクロストーク現象が改善されることになる。しかしながら半導体チップ７の入力突起電極８の高さが５～２０μｍにたいして出力突起電極１９の高さが１１０～１３０μｍと非常に高くなってしまう。この出力突起電極１９の加工は可能であるが、電極としての安定性、導電性接着剤の塗布方法および量産性を考慮すると好ましくない。

【００１０】そこで出力突起電極の高さと入力突起電極の高さをと同一として、かつ入力突起電極８と金属配線６を直接接着する方法が考えられる。以下図８を用いてその例について説明する。半導体チップ７に入力突起電極１８と出力突起電極９をメッキ法や真空蒸着法で銅や金の金属を用いて形成する。つぎに前記出力突起電極９の先端部にエポキシ系の接着剤に導電粒を混入した導電性接着剤１０を印刷法やディップ法で塗布する。その後、双眼顕微鏡を用いて表示パネル基板１の表示駆動接続電極２と、半導体チップ７に設けた出力突起電極９とを、入力突起電極１８が表示パネル基板１の外部に出るようにして双眼顕微鏡を用いて位置合わせを行う。つづいて半導体チップ７を加圧して、表示パネル基板１に仮接続した状態で導電性接着剤１０を加熱し硬化させる。

【００１１】次に半導体チップ７の出力突起電極９の周辺領域にエポキシ系や、ゴム系などの有機材料からなる絶縁樹脂１１を注入したのち加熱し硬化させる。この工程では、入力突起電極１８の周辺に絶縁樹脂１１がまわり込まないように注意する。次にＦＰＣ５に異方導伝性シート１２を仮接着する。また半導体チップ７は下向きの状態でＦＰＣ５の金属配線６と半導体チップ７の入力突起電極１８との位置合わせを行う。つづいてＦＰＣ５側から異方導伝性シート１２を熱圧着してＦＰＣ５と半導体チップ７を接着する。これによって金属配線６と入力突起電極１８が接続される。最後に図示はしていないがエポキシ系や、ゴム系樹脂をＦＰＣ５と半導体チップ７の周辺に形成し各接続部を保護する。以上の方法によれば出力突起電極９の高さは５～２０μｍにすることができる。しかしながらこの実装構造も製造工程中あるいは完成後に外力が加わった場合接続部が破損する危惧があり、量産性の面で好ましくない。

【００１２】

【発明が解決しようとする課題】そこで本発明の課題は、表示パネルへ半導体チップをＣＯＧ法によって実装する場合において、ＦＰＣの金属配線と半導体チップの入力突起電極とを直接接続し、かつ表示パネルに外力が加わった場合でも破損しないよう接続部を補強することにより高い接続信頼性を備え、量産性に優れた半導体チップの実装構造を提供することにある。

【００１３】

【課題を解決するための手段】上記の課題を解決するために本発明の表示パネル駆動用半導体チップの実装構造は、金属配線を有するフレキシブル印刷基板と、表示パネルの一部を構成し周辺部に表示駆動接続電極を有する表示パネル基板と、前記フレキシブル印刷基板および前記表示パネル基板の両者にまたがり前記金属配線および前記表示駆動接続配線にそれぞれ導電性接着剤により接着されている入力突起電極および出力突起電極を有する半導体チップと、前記フレキシブル印刷基板および前記表示パネル基板の両者にまたがって裏打ちされ両者の当接部を補強する補助基板とからなる実装構造であって、前記補助基板は段差により高さの異なる上段部および下段部を有し、前記金属配線および前記表示駆動接続電極が、ほぼ同一平面上に並ぶように前者を上段部に後者を下段部にそれぞれ接着固定していることを特徴とする。

【００１４】

【作用】上段部と下段部からなる段差を有する補助基板の下段部に表示駆動接続電極を有する表示パネル基板を接着し、次に上段部に金属配線を有するＦＰＣを接着する。この時、表示駆動接続電極と金属配線がほぼ同一平面上に並ぶように補助基板の段差を表示パネル基板の厚さとＦＰＣの厚さとの差と同じ値に設定する。次にＦＰＣおよび表示パネル基板の両者にまたがり金属配線および表示駆動接続配線にそれぞれ半導体チップ上の入力突起電極および出力突起電極を導電性接着剤により接続する。この結果、金属配線と入力突起電極は導電性接着剤を介して直接接続され半導体チップへの入力接続抵抗を小さくし、入力する電源電圧を安定化することでクロストーク現象を抑えることができる。さらに補助基板がＦＰＣおよび表示パネル基板の両者にまたがって裏打ちし、金属配線と入力突起電極および表示駆動接続配線と出力突起電極のそれぞれの接続部を補強する実装構造となっている。この結果、半導体チップの実装工程中または完成後に誤って加わる外力に対しても接続部の破損を防止することができ接続信頼性を向上させることが可能となる。

【００１５】

【実施例】本発明の実施例を図面に基づいて説明する。図１は本発明の実施例の半導体チップの実装構造の断面形状を示す模式拡大図である。図２は、本発明の実施例における補助基板の断面形状を示す模式拡大図である。図３および図４は、本発明の実施例の半導体チップの実装方法の中間工程の断面形状を示す模式拡大図である。図５は本発明の実施例の半導体チップの実装構造の平面形状を示す模式拡大図である。

【００１６】以下本発明の実施例について液晶表示装置における半導体チップの実装構造を例として説明する。図２に示す補助基板３は、熱硬化性のエポキシ樹脂からなり、金型を用いて成形加工したものであり、上段部３１および下段部３２を有する。次に図３に示すようにガラスからなり、周辺部に表示駆動接続電極２を配置した表示パネル基板１を補助基板３の下段部３２に、接着剤

４を介してヒートツールで加圧しながら８０～１２０℃に加熱し接着剤４を硬化させ接着した。上記表示駆動接続電極２は、ＩＴＯなどの透明導電膜で構成されている。

【００１７】次に図５に示すように補助基板３の下段部３２に接着した表示パネル基板１とＦＰＣ５とにそれぞれ設けた位置合わせマーク１５を用いて位置合わせを行う。つづいて図４に示すように補助基板３の上段部３１にＦＰＣ５を接着剤４を介してヒートツールで加圧しながら８０～１２０℃に加熱し接着剤４を硬化させ接着する。この状態で表示駆動接続電極２と金属配線６とがほぼ同一平面上に並ぶように補助基板３の上段部３１と下段部３２との間に段差３３が設けられている。段差３３の大きさは表示パネル１とＦＰＣ５の厚さの差と等しくすれば良いが、接着剤４の厚さで調整できるので、厳密に両者の厚さの差に等しくする必要はない。

【００１８】さらにヒートツールを用いるとき表示パネル基板１の表示駆動接続電極２にもヒートツールが当たるようにすればＦＰＣ５の金属配線６と表示パネル基板１の表示駆動接続電極２との高さを揃えることが容易となる。また、補助基板３の上段部３１の幅寸法は、すくなくとも半導体チップ７上の入力突起電極８の幅よりも大きければよく、０．１ｍｍ～５ｍｍあればよい。また補助基板３の下段部３２の幅寸法は、すくなくとも半導体チップ７上の出力突起電極９の幅よりも大きく、また表示パネル構成部に掛からない大きさであればよく、０．１ｍｍ～５ｍｍあればよい。

【００１９】接着剤４は、液状の場合は、ディスペンサで補助基板３の上段部３１および補助基板３の下段部３２に供給し、フィルム状接着剤４の場合はそれぞれに対応する大きさに切り出して張り付ける。いずれにしても接着剤４は、補助基板３上に設けても、或いはＦＰＣ５側および表示パネル基板１側に設けても、どちらでもよい。また接着剤４は、エポキシ等の樹脂に接着厚さ調整用の粒径がプラスマイナス１０％以内で揃ったプラスチックビーズや、ガラスファイバーを５～３０ｗｔ％混入したものを使用するのが望ましい。これにより接着剤４の厚さを制御することが容易となる。

【００２０】つぎに半導体チップ７に入力突起電極８と出力突起電極９をメッキ法や真空蒸着法で銅や金の金属を用いて形成する。この入力突起電極８と出力突起電極９の形状は直径５０～２００μｍの円形が好ましい。つぎに、前記入力突起電極８と出力突起電極９の先端部にエポキシ系の接着剤に導電粒を混入した導電性接着剤１０を印刷法やディップ法で一定量を塗布する。　その後、図５に示すように双眼顕微鏡を用いて半導体チップ７と表示パネル基板１に配置した表示駆動接続電極２とＦＰＣ上の金属配線６との位置を合わせを行い、図１に示すように表示駆動接続電極２および金属配線６にそれぞれ出力突起電極９および入力突起電極８を接続する。この後５０～１５０℃の温度で加熱処理を行い導電性接着剤１０を硬化させた。これにより出力突起電極９と表示駆動接続電極２および入力突起電極８と金属配線６は良好な電気的接続が得られた。最後にＦＰＣ５と半導体チップ７、および表示パネル基板１の周辺領域にエポキシ系や、ゴム系などの有機材料からなる絶縁性樹脂１１を充填し、その後、絶縁性樹脂１１を加熱硬化させる。

【００２１】画面サイズが対角４インチの単純マトリックス方式液晶パネルの実装において、信号電極用半導体チップはＣＯＧ法で接続し、走査電極用半導体チップを本発明の実装構造で接続した結果、クロストークの少ない良好な表示画像が得られ、実装中および完成後においても接続部が破損する現象は発生しなかった。

【００２２】本発明の実施例の説明では、補助基板３の材料を熱硬化性のエポキシ樹脂を使用した例で説明したが適度な剛性を持ち、２００℃以上の耐熱性があれば、金属、セラミック、プラスチック等自由に選択できる。また、本発明の実施例の説明では、半導体チップの実装構造を導電性接着剤を使用した例で説明したが、導電性接着剤の代わりに、光硬化性樹脂や異方導電性シートや導電性ビーズを使用して、半導体チップ７の入力突起電極８および出力突起電極と、表示パネル基板１の表示駆動接続電極２およびＦＰＣ５の金属配線６とをそれぞれ接続しても、同様の結果が得られた。なお、光硬化性樹脂を使用した場合は図１に示す絶縁樹脂１１は不要となる。また図３では補助基板３の下段部３２と表示パネル基板１との接着を液晶表示パネルの画像表示部分が完成した後で行っているが、液晶表示パネルの画像表示部分が完成する前の工程において、表示パネル基板１へ表示駆動接続電極２を形成した後に補助基板３の下段部３２に接着してもよい。

【００２３】

【発明の効果】以上に述べたように本発明によれば、ＣＯＧ法の特徴である半導体チップの出力突起電極と表示パネル基板の表示駆動接続配線の接続を高密度で実現しながら、半導体チップへの入力抵抗を数オーム以下で接続でき、入力電源電圧が安定することにより表示装置のクロストーク現象を低減することができる。さらに補助基板が接続部を補強することにより半導体チップの実装工程中または完成後に誤って加わる外力に対しても接続部の破損を防止することができ接続信頼性を向上させることができる。

【図面の簡単な説明】

【図１】本発明の実施例における半導体チップの実装構造の断面形状を示す模式拡大図である。

【図２】本発明の実施例における補助基板の断面形状を示す模式拡大図である。

【図３】本発明の実施例における接続工程を説明するための実装構造の断面形状を示す模式拡大図である。

【図４】本発明の実施例における接続工程を説明するた

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めの実装構造の断面形状を示す模式拡大図である。

【図５】本発明の実施例における半導体チップの実装構造の平面形状を示す模式拡大図である。

【図６】従来例における半導体チップの実装構造の断面形状を示す模式拡大図である。

【図７】従来例における半導体チップの実装構造の断面形状を示す模式拡大図である。

【図８】従来例における半導体チップの実装構造の断面形状を示す模式拡大図である。

【符号の説明】

1　表示パネル基板
2　表示駆動接続電極
3　補助基板
4　接着剤
5　フレキシブル印刷基板

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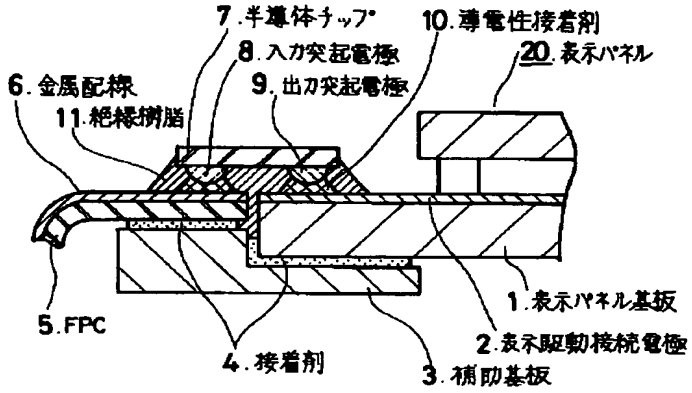
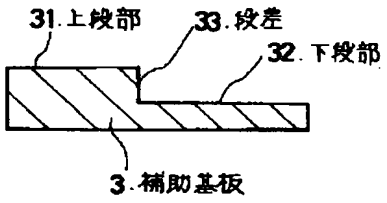
6　金属配線
7　半導体チップ
8　入力突起電極
9　出力突起電極
１０　導電性接着剤
１１　絶縁樹脂
１２　異方導電性シート
１５　位置合わせマーク
１８　入力突起電極
１９　出力突起電極
２０　表示パネル
２１　入力接続電極
３１　上段部
３２　下段部
３３　段差

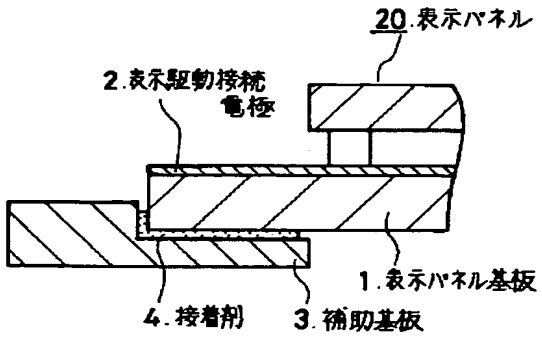
【図１】



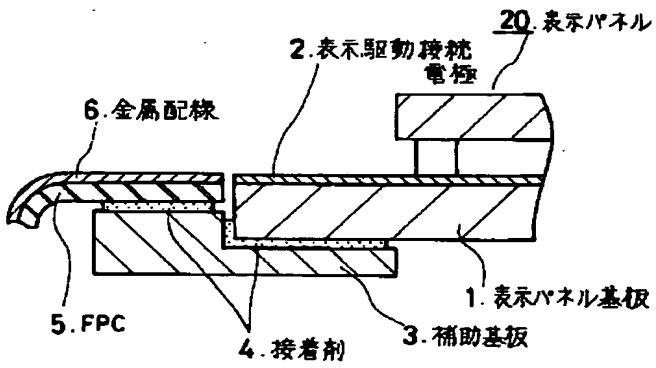
【図２】



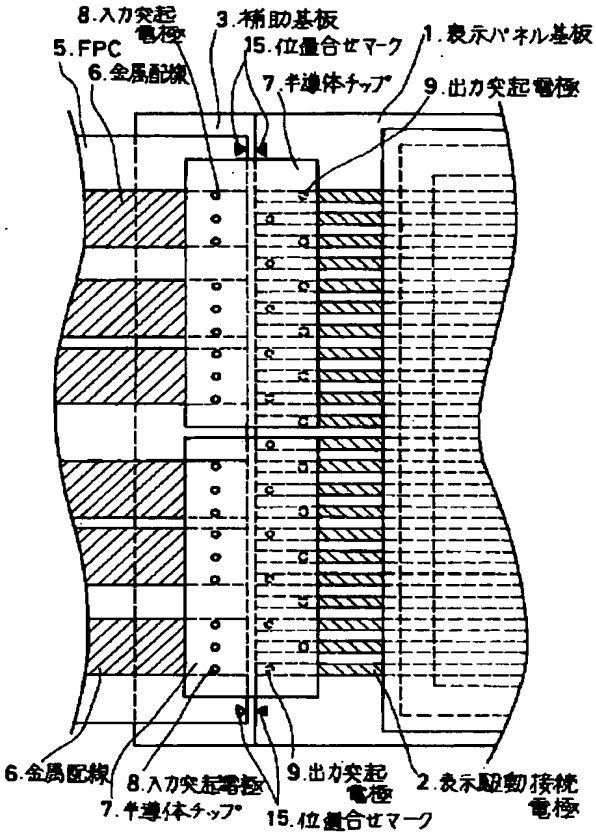
【図３】



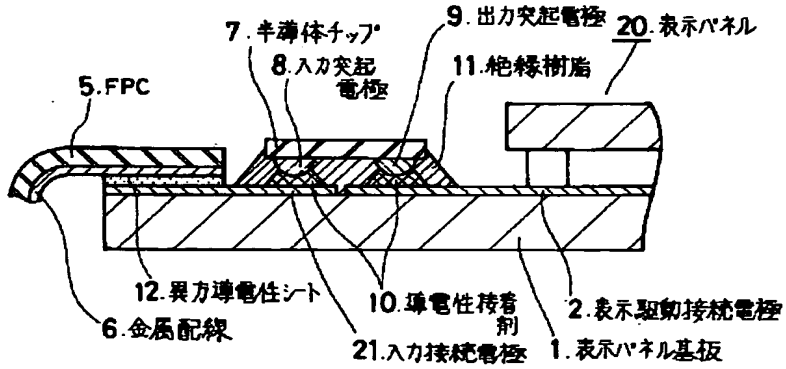
【図４】



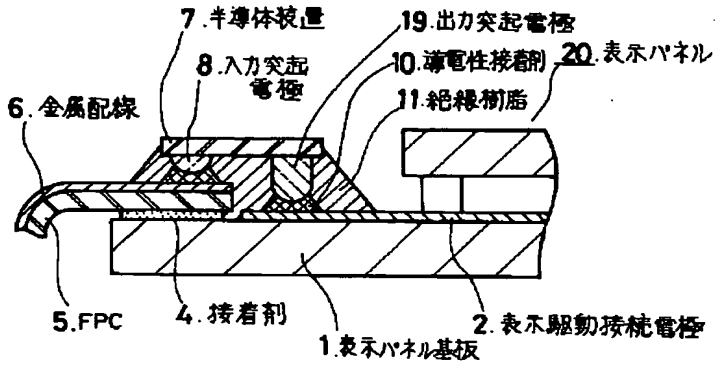
【図５】


8.入力突起電極
3.補助基板
1.表示パネル基板
5.FPC
15.位置合せマーク
6.金属配線
7.半導体チップ
9.出力突起電極
6.金属配線
8.入力突起電極
9.出力突起電極
2.表示駆動接続電極
7.半導体チップ
15.位置合せマーク

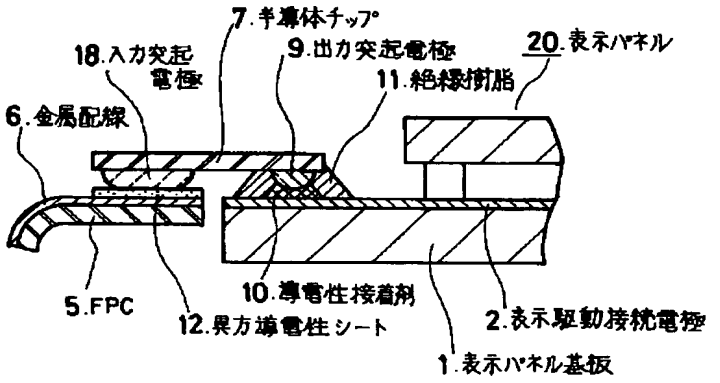
【図６】


7.半導体チップ
9.出力突起電極
20.表示パネル
8.入力突起電極
11.絶縁樹脂
5.FPC
12.異方導電性シート
10.導電性接着剤
2.表示駆動接続電極
6.金属配線
21.入力接続電極
1.表示パネル基板

【図７】


7.半導体装置
19.出力突起電極
8.入力突起電極
10.導電性接着剤
20.表示パネル
11.絶縁樹脂
6.金属配線
5.FPC
4.接着剤
1.表示パネル基板
2.表示駆動接続電極

【図８】


7.半導体チップ
18.入力突起電極
9.出力突起電極
20.表示パネル
11.絶縁樹脂
6.金属配線
5.FPC
10.導電性接着剤
12.異方導電性シート
2.表示駆動接続電極
1.表示パネル基板